# Excel

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# Example

At today you pay 15 so -15

After 1 year, you receive 8

~ 2 ~ ——— 8

| | A | B | C | D |
|---|---|---|---|---|
| 1 | Time | Value | PV | r |
| 2 | 0 | -15 | | 0.10 |
| 3 | 1 | 8 | | |
| 4 | 2 | 8 | | |
| 5 | 3 | 8 | | |

discount rate is 0.1

# PV Formula in Excel

| | A | B | C | D |
|---|---|---|---|---|
| 1 | Time | Value | PV | r |
| 2 | 0 | -15 | =B2/(1+$D$2)^A2 | 0.10 |
| 3 | 1 | 8 | | |
| 4 | 2 | 8 | | |
| 5 | 3 | 8 | | |

# Copy & Paste the formula

| | A | B | C | D |
|---|---|---|---|---|
| 1 | Time | Value | PV | r |
| 2 | 0 | -15 | -15 | 0.10 |
| 3 | 1 | 8 | =B3/(1+$D$2)^A3 | |
| 4 | 2 | 8 | 6.6 | |
| 5 | 3 | 8 | 6.0 | |

# Net Present Value - NPV

| | A | B | C | D |
|---|---|---|---|---|
| 1 | Time | Value | PV | r |
| 2 | 0 | -15 | -15 | 0.10 |
| 3 | 1 | 8 | 7.3 | |
| 4 | 2 | 8 | 6.6 | |
| 5 | 3 | 8 | 6.0 | |
| 6 | | | | |
| 7 | | NPV | 4.9 | |

# Approximate Perpetuity

| | A | B | C | D | E |
|---|---|---|---|---|---|
| 1 | Time | Value | PV | r | NPV |
| 2 | 1 | 8 | 7.3 | 0.10 | =SUM(C:C) |
| 3 | 2 | 8 | 6.6 | | |
| 4 | 3 | 8 | 6.0 | | |
| 5 | 4 | 8 | 5.5 | | |
| 6 | 5 | 8 | 5.0 | | |
| 7 | 6 | 8 | 4.5 | | |
| 8 | 7 | 8 | 4.1 | | |
| 9 | 8 | 8 | 3.7 | | |
| 10 | 9 | 8 | 3.4 | | |
| 11 | 10 | 8 | 3.1 | | |
| 12 | 11 | 8 | 2.8 | | |
| 13 | 12 | 8 | 2.5 | | |
| 14 | 13 | 8 | 2.3 | | |
| 15 | 14 | 8 | 2.1 | | |

# Same Results

| | A | B | C | D | E |
|---|---|---|---|---|---|
| 1 | Time | Value | PV | r | NPV |
| 2 | 1 | 8 | 7.3 | 0.10 | 80.0 |
| 3 | 2 | 8 | 6.6 | | |
| 4 | 3 | 8 | 6.0 | | |
| 5 | 4 | 8 | 5.5 | | |
| 6 | 5 | 8 | 5.0 | | |
| 7 | 6 | 8 | 4.5 | | |
| 8 | 7 | 8 | 4.1 | | |
| 9 | 8 | 8 | 3.7 | | |
| 10 | 9 | 8 | 3.4 | | |
| 11 | 10 | 8 | 3.1 | | |
| 12 | 11 | 8 | 2.8 | | |
| 13 | 12 | 8 | 2.5 | | |
| 14 | 13 | 8 | 2.3 | | |
| 15 | 14 | 8 | 2.1 | | |

# Why?

| | | | |
|---|---|---|---|
| 195 | 194 | 8 | 0.0000001 |
| 196 | 195 | 8 | 0.0000001 |
| 197 | 196 | 8 | 0.0000001 |
| 198 | 197 | 8 | 0.0000001 |
| 199 | 198 | 8 | 0.0000001 |
| 200 | 199 | 8 | 0.0000000 |
| 201 | 200 | 8 | 0.0000000 |
| 202 | 201 | 8 | 0.0000000 |
| 203 | 202 | 8 | 0.0000000 |
| 204 | 203 | 8 | 0.0000000 |
| 205 | 204 | 8 | 0.0000000 |
| 206 | 205 | 8 | 0.0000000 |
| 207 | 206 | 8 | 0.0000000 |

# Takeaways

Excel is a useful tool for brute force calculations

Some financial formulas can easily be approximated using Excel

Absolutely. This example is showing normal NPV with cash flows over 3 years, not forever.

Step 1: Understand the cash flows

| Time | Cash Flow |
|---|---|
| 0 | -15 |
| 1 | +8 |
| 2 | +8 |
| 3 | +8 |

At Time 0, you pay 15 today.

That is why it is shown as:

Cash flow at Time 0 = -15

Then you receive:

Year 1 = 8
Year 2 = 8
Year 3 = 8

The discount rate is:

r = 10% = 0.10

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Step 2: Why can't we just add the cash flows?

You may think:

NPV = -15 + 8 + 8 + 8
NPV = 9

But this is not correct because money received in the future is worth less than money received today.

Why?

Because money today can be invested and earn a return.

So we need to convert each future cash flow into today's value first.

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Step 3: Convert each future payment into present value

The formula is:

PV = FV / (1 + r)^t

Where:

PV = Present Value
FV = Future Value
r = discount rate
t = number of years

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Year 1

You receive 8 after 1 year.

PV = 8 / (1.10)^1
PV = 8 / 1.10
PV = 7.27

Rounded:

PV = 7.3

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Year 2

You receive 8 after 2 years.

PV = 8 / (1.10)^2
PV = 8 / 1.21
PV = 6.61

Rounded:

PV = 6.6

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Year 3

You receive 8 after 3 years.

PV = 8 / (1.10)^3

PV = 8 / 1.331

PV = 6.01

Rounded:

PV = 6.0

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Step 4: Add all present values

| Time | Present Value |
|---|---|
| 0 | -15.0 |
| 1 | 7.3 |
| 2 | 6.6 |
| 3 | 6.0 |

Now calculate NPV:

NPV = -15 + 7.3 + 6.6 + 6.0

NPV = 4.9

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What does NPV = 4.9 mean?

It means the investment costs 15 today.

But the future cash flows are worth 19.9 today.

Because:

7.3 + 6.6 + 6.0 = 19.9

So:

NPV = 19.9 - 15
NPV = 4.9

This means the investment creates 4.9 units of value.

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Easy way to understand

You pay 15 today.

In return, you receive:

8 in Year 1
8 in Year 2
8 in Year 3

But because future money is worth less than today's money, we discount them:

Year 1 value today = 7.3
Year 2 value today = 6.6
Year 3 value today = 6.0

Total value today = 19.9

So you are paying 15 to receive something worth 19.9 today.

That means you gain:

19.9 - 15 = 4.9

So this is a good investment.

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Shortcut to remember

Positive NPV > 0 = Good investment
NPV = 0 = Fair investment
Negative NPV < 0 = Bad investment

In this example:

NPV = 4.9

So the investment is worth taking.